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D.L. Dyekman 8.20.04
(Print and Sign)

Responsible Manager

L. P. Diediker 8-23-04
(Print and Sign)

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General Counsel	☒	Stephen B. Cherry	Stephen B. Cherry	(Y) / N
Office of External Affairs	☐			Y / N
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RESPONSIBLE CONTACTS

	Name	Phone Number
Author:	D. L. Dyekman D L Dyekman 8-23-04	373-2530
Interpretive Authority (IA)*:	N/A	

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Revision 13

Environmental Releases for Calendar Year 2003

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Fluor Hanford
P.O. Box 1000
Richland, Washington

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Environmental Releases for Calendar Year 2003

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Fluor Hanford
P.O. Box 1000
Richland, Washington

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Prepared by: _____ 8-20-04
D. L. Dyekman, Engineer — Date
Monitoring & Reporting
Environmental Protection
Fluor Hanford, Inc.

Reviewed by: _____ 8/20/04
D. J. Rokkan, Engineer — Date
Monitoring & Reporting
Environmental Protection
Fluor Hanford, Inc.

Approved by: _____ 8/20/04
L. P. Diediker, Manager — Date
Monitoring & Reporting
Environmental Protection
Fluor Hanford, Inc.

Approved by: _____ 20 Aug 04
R. H. Gurske, Director — Date
Environmental Protection
Fluor Hanford, Inc.

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EXECUTIVE SUMMARY

This report fulfills the annual reporting requirements of U.S. Department of Energy (DOE) Order 450.1, *Environmental Protection Program* and DOE Manual 231-1-1A, *Environment, Safety, and Health Reporting Manual*. The report contains tabular data summaries on air emissions and liquid effluents released to the environment as well as nonroutine releases during calendar year (CY) 2003. These radioactive and hazardous releases were from Bechtel Hanford, Inc. (BHI), CH2M HILL Hanford Group, Inc. (CH2M HILL), Bechtel National, Inc. (BNI), and Fluor Hanford (FH) managed facilities and activities. The releases were estimated from direct sampling and analysis data and from calculations based upon approved release factors. This report was prepared in accordance with 10 CFR 830.120, *Quality Assurance*; DOE Order 414.1B, *Quality Assurance*; NQA-1, *Quality Assurance Requirements for Nuclear Facility Application;* EPA QA/R-2, EPA *Requirements for Quality Management Plans;* and EPA QA/R-5, *Requirements for Quality Assurance Project Plans*.

This report further serves as a supplemental resource to the *Hanford Site Environmental Report* (HSER; PNNL–14687), published by the Pacific Northwest National Laboratory. The HSER includes a yearly accounting of the impacts on the surrounding populace and environment from major activities at the Hanford Site. The HSER also summarizes the regulatory compliance status of the Hanford Site.

Tables ES-1 through ES-4 display data summaries of CY2003 air emission and liquid effluent releases. The data displayed in these tables compiles the following information:

- Radionuclide air emissions (refer to Table ES-1)
- Nonradioactive air emissions (refer to Table ES-2)
- Radionuclides in liquid effluents discharged to ground (refer to Table ES-3)
- Radionuclides discharged to the Columbia River (refer to Table ES-4).

Table ES-1. Radionuclide Air Emissions from Facilities Managed by BHI, CH2M HILL and FH during 2003.

Radionuclide	Release, Ci[a]
^{3}H (HTO)[b]	6.6 E–01
^{60}Co	3.9 E–08
^{90}Sr	1.6 E–04
^{106}Ru	1.1 E-06
^{125}Sb	0
^{129}I	1.4 E–03
^{137}Cs	9.2 E–05
^{152}Eu	0
^{155}Eu	0
^{234}U	6.3 E-11
^{235}U	4.6 E-11
^{238}U	3.5 E-11
^{238}Pu	1.7 E–06
$^{239/240}Pu$	8.7 E–05
^{241}Pu	9.5 E–05
^{241}Am	1.8 E–05

[a] 1 curie = 3.7 E+10 becquerels.

[b] HTO = tritiated water.

Table ES-2. Nonradioactive Constituents in Air Emissions from Facilities Managed by CH2M HILL and FH during 2003.

Constituent	Quantities, lb (kg)
Particulate (PM_{10} and $PM_{2.5}$[a])	3.7 E+03 (1.7 E+03)
Sulfur oxides (SO_x)	8.4 E+03 (3.8 E+03)
Nitrogen oxides (NO_x)	3.2 E+04 (1.5 E+04)
Carbon monoxide (CO)	3.6 E+04 (1.6 E+04)
Volatile organic compounds	2.5 E+04 (1.1 E+04)
Ammonia	3.6 E+04 (1.6 E+04)
Lead	1.4 E-00 (6.4 E-01)
Toxic air pollutants	1.8 E+04 (8.1 E+03)

[a] PM_{10} and $PM_{2.5}$ refer to particulate matter with diameters of 10 μm and 2.5 μm, respectively.

Table ES-3. Radionuclides in Liquid Effluents Discharged to State-Approved Land Disposal Site[a] Managed by FH during 2003.

Radionuclide	Effluent source	Volume, gal (L)[b]	Average flow rate, gpm (Lpm)	Release, Ci[b]
^{3}H	200 Area Effluent Treatment Facility	2.6 E+07 (9.8 E+07)	49 (186)	4.9 E+00

[a] The State-Approved Land Disposal Site is also known as the 616 Crib.
[b] 1 gal = 3.785 L.

Table ES-4. Radionuclides in Liquid Effluents Discharged to the Columbia River from Facilities Managed by BHI and FH during 2003.

Radionuclide	Release, Ci[a]
^{3}H	1.5 E–02
^{60}Co	0
^{90}Sr	9.3 E–02
^{125}Sb	0
^{134}Cs	0
^{137}Cs	0
^{238}Pu	3.8 E-07
$^{239/240}Pu$	7.1 E–06
^{241}Am	0

[a] 1 curie = 3.7 E+10 becquerels.

CONTENTS

TABLES

GLOSSARY

AOP	Air Operating Permit
BNI	Bechtel National, Inc.
BHI	Bechtel Hanford, Incorporated
BOD	biological oxygen dependence
Bq	becquerel
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
CH2M HILL	CH2M HILL Hanford Group, Inc.
Ci	curie
DCG	derived concentration guide
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
Ecology	State of Washington Department of Ecology
EDE	effective dose equivalent
EDP Code	electronic data processing code
EP	external publication
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESPC	energy savings performance contract
ETF	Effluent Treatment Facility
FH	Fluor Hanford
FFTF	Fast Flux Test Facility
ft^3	cubic foot
gal	gallons as in gallons per minute
HEHF	Hanford Environmental Health Foundation
HEPA	high-efficiency particulate air (filter)
HSER	Hanford Site Environmental Report
HT	tritium gas
HTO	tritiated water
kg	kilogram
L	liter
LWDF	Liquid Waste Disposal Facility

GLOSSARY (cont)

m^3	cubic meter
MASF	Maintenance and Storage Facility
MEI	maximally exposed individual
μCi	microcurie
μSv	microsievert
ml	milliliter
mrem	millirem (unit of dose)
MSGP	multi-sector general permit
ND	no discharge
NPDES	National Pollutant Discharge Elimination System
NM	not measured
NQ	not quantifiable
PCB	polychlorinated biphenyl
pCi	picocurie
PFP	Plutonium Finishing Plant
PHMC	Project Hanford Management Contract
PNNL	Pacific Northwest National Laboratory
POTW	publicly owned treatment works
$PM_{2.5}$	particulate matter with a diameter of 2.5 μm
PM_{10}	particulate matter with a diameter of 10 μm
ppm	parts per million
PSD	Prevention of Significant Deterioration
PUREX	plutonium-uranium extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	reduction-oxidation
RQ	reportable quantity
SALDS	State-Approved Land Disposal Site
TEDF	Treated Effluent Disposal Facility
TRIGA	Test Reactor and Isotope Production, General Atomics
TRU	transuranic
TRUSAF	224-T Transuranic Waste Storage and Assay Facility
UO_3	uranium trioxide
WAC	Washington Administrative Code
WDOH	Washington State Department of Health
WESF	Waste Encapsulation Storage Facility
WMH	Waste Management Federal Services of Hanford, Incorporated
WRAP	Waste Receiving and Processing Facility
WSCF	Waste Sampling and Characterization Facility
WTP	Hanford Tank Waste Treatment and Immobilization Plant

ENVIRONMENTAL RELEASES FOR CALENDAR YEAR 2003

1.0 INTRODUCTION

Bechtel Hanford, Inc. (BHI), CH2M HILL Hanford Group, Inc. (CH2M HILL), Bechtel National, Inc., and Fluor Hanford (FH) are responsible for monitoring radioactive and nonradioactive material in environmental air emission and liquid effluent releases from the U.S. Department of Energy (DOE) Hanford Site facilities. This report documents releases during calendar year 2003, thereby fulfilling the annual reporting requirements of DOE Order 450.1. Release data are presented in both summary and in detailed tabular forms.

This report also supplements information in the *Hanford Site Environmental Report for Calendar Year 2003* (HSER; PNNL–14687), published by Battelle's Pacific Northwest National Laboratory (PNNL). The HSER report details PNNL effluent releases and contains a public accounting of Hanford Site activities that affect the environment, as well as a summary of the compliance status of Hanford Site with environmental regulations.

1.1 TYPES AND LOCATIONS OF RELEASES

Radioactive air emissions were released in calendar year (CY) 2003 from facilities and activities in the 100, 200, 300, 400, and 600 Areas of the Hanford Site. Radioactive liquid effluents were discharged to the soil in the 600 Area and to the Columbia River along the riverbank bordering the 100-K and 100-N Areas. The 100-N N Springs area contributes a small amount of radioactive material to the Columbia river due to historical discharges of wastewater to the ground, which in turn influence groundwater flow feeding the river shoreline seeps.

Nonradioactive air emissions of industrial origin at Hanford during 2003 are (1) fossil-fuel combustion emissions from the operation of package boilers; (2) fossil-fuel combustion emissions from generators and (3) emissions of nitrogen oxides, ammonia, and volatile organic compounds from the 242-A Evaporator, the 200 Area Effluent Treatment Facility (ETF), and tanks containing radioactive liquid waste. Most of these sources are located in the 200 and 300 Areas.

Nonradioactive process wastewater in the 200 Area is sent to the 200 Area Treated Effluent Disposal Facility (TEDF) for discharge to ground by way of two percolation basins. Radioactive wastewater from many Hanford Site sources is treated at 200 Area ETF and then discharged to ground at the State Approved Land Disposal Site (SALDS). Wastewater generated in the 300 Area is sent to the 300 Area TEDF for treatment before being discharged to the Columbia River via a permitted outfall. The 100-N Sewage Treatment Lagoon receives sanitary wastewater from 100-N facilities and from failed septic systems in the 100-K and 200 Areas. Sanitary wastewater in the 100-DR and 100-K Areas is discharged into septic tanks or to drain fields. In the 200 Areas, sanitary wastewater is discharged to several septic tanks or subsurface disposal systems located there. Sanitary wastewater in the 300 Area is discharged to the city of Richland's publicly owned treatment works (POTW). Sanitary wastewater in the 400 Area is discharged to the Columbia Generating Station sewage treatment plant.

1.2 ENVIRONMENTAL RELEASE LIMITS AND GUIDELINES

This section presents relevant environmental release standards for radiological and nonradiological constituents. These standards are applicable to the release and environmental transport of constituents and are important to (1) demonstrate compliance with any issued federal, state, or local permits and to (2) demonstrate compliance with any federal, state, or local regulations, or guidelines prescribed by the U.S. Department of Energy, Richland Operations Office (DOE-RL).

The HSER report (PNNL–14687) contains a PNNL assessment of the Hanford Site radiological dose impact to the public in accordance with DOE Orders 450.1 and 5400.5. Effluent data contained in the HSER and in the *Radionuclide Air Emissions Report for the Hanford Site Calendar Year 2003* (DOE/RL-2004-09) were used by PNNL to estimate offsite radiological doses. The offsite radiological dose demonstrates compliance with applicable regulations. Related compliance determinations to federal and state dose standards are also published in the HSER.

1.2.1 Limits for Radioactive Releases

Quantities of radionuclides in air emissions and liquid effluents from the Hanford Site are governed by DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. Quantities of radionuclides in air emissions are also regulated by Title 40 of the Code of Federal Regulations (CFR) Part 61, Subpart H, and by the Washington Administrative Code (WAC) Chapter 246-247. The effective dose equivalent (EDE) received by any member of the offsite public from all Hanford Site routine operational effluents and emissions is not to exceed 100 mrem/yr (1 mSv/yr). For occasional exposure from noncontinuous releases, the EDE is not to exceed 500 mrem/yr (5 mSv/yr). From the air pathway only, the EDE to any member of the public is not to exceed 10 mrem/yr (0.1 mSv/yr). The derived concentration guide (DCG) values published in DOE Order 5400.5 apply to all radioactive effluents and emissions potentially exposing members of the public. DCG values are not emissions limits and are used for comparison purposes only.

The 300 Area TEDF is regulated by an aquatic-lands sewer outfall lease (Lease Number 20–012257) from the U.S. Department of Natural Resources. Limits for radioactive constituents include 15 pCi/L (5.5 E+02 Bq/m^3) alpha, 50 pCi/L (1.9 E+03 Bq/m^3) beta, and 20,000 pCi/L (7.4 E+05 Bq/m^3) tritium.

1.2.2 Limits for Nonradioactive Releases

The following regulations, as applicable, govern nonradioactive constituents in air emissions and liquid effluents: *Clean Water Act of 1977, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980; Resource Conservation and Recovery Act (RCRA) of 1976; Safe Drinking Water Act of 1974; Toxic Substances Control Act of 1976;* the State of Washington regulations WAC 173-216, 173-218, 173-303, 173-400, 173-401, and 173-460; and the Benton County Clean Air Authority *Regulation 1*.

The Washington State Department of Ecology (Ecology) issues permits governing Hanford Site liquid effluent discharges to the ground per the requirements of WAC 173-216. Monitoring, sampling, analysis parameters, and release limits for specific constituents are defined in discharge permits issued by Ecology.

The U.S. Environmental Protection Agency (EPA) issues permits governing Hanford Site liquid effluents discharged to the Columbia River per the requirements of the National Pollutant Discharge Elimination System (NPDES) regulations. Monitoring, sampling, analysis parameters, and release limits for specific constituents are defined in discharge permits issued by the EPA.

2.0 AIR EMISSIONS

BHI, BNI, CH2M HILL, and FH managed facilities and activities released radioactive and nonradioactive air emissions to the atmosphere during 2003. Release data for each type of emission are discussed separately.

2.1 RADIONUCLIDE AIR EMISSIONS

Radionuclide air emissions from actively ventilated point sources having a potential to emit radioactive material to the atmosphere are routinely monitored. Actively ventilated point source emissions are measured and documented in this report when the following criteria were met during calendar year 2003: (1) the point source requires continuous monitoring or periodic confirmatory measurements in accordance with 40 CFR 61, Subpart H, or WAC 246-247, (2) the point source is listed in the *Hanford Site Title V Air Operating Permit 00-05-006* (AOP), and (3) the point source normally emits radioactive material or has the potential to emit radioactive material. Point sources not included in this section either did not meet those criteria or their air emissions were not actively ventilated. Examples of sources without active ventilation include deactivated sources, sources sealed off from the atmosphere, and passively ventilated point sources. Actively ventilated point sources were sampled for radioactive air emissions only if they had a potential to emit radionuclides.

Radionuclide air emissions from passively vented point sources are monitored as diffuse and fugitive emissions. Diffuse and fugitive emissions are monitored collectively by the Near-Facility Monitoring Program and the Environmental Surveillance Program. Monitoring data from these sources are not presented in this report but are available in the *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 2003* (DOE/RL-2004-09), the HSER (PNNL-14687), and the *Hanford Site Near-Facility Environmental Monitoring Data Report for Calendar Year 2003* (PNNL-14687, APP. 2).

2.1.1 Mitigation of Radionuclide Air Emissions

The following examples of radionuclide air emission removal systems are used at the Hanford Site: (1) high-efficiency particulate air (HEPA) filters, (2) sand filters, (3) charcoal absorbers (for iodine removal), (4) water scrubbers, (5) deep-bed fiberglass filters, and (6) fiberglass prefilters. No practical air emissions removal systems exist for tritium effluents. Generally, at least one stage of HEPA filtration is used as the final particulate removal method before air is discharged to the atmosphere. All installed HEPA filters are required to have an in place removal efficiency of ≥99.95% for polydispersed airborne particles with a median diameter of 0.7 μm. Routine in place testing of HEPA filters assures ventilation systems operate at the prescribed level of efficiency. HEPA filtration systems have proven effective at mitigating radioactive air emissions as indicated by release concentrations near or below the lowest limits of analytical detection.

2.1.2 Radionuclide Air Emissions Data

Radionuclide air emission release data from facilities, by operating area, are in Table 2-1. Table 2-2 presents radionuclide air emission data from major point sources while Table 2-3 presents radionuclide air emission data from minor point sources. Major point sources have a potential to emit radionuclides greater than 0.1 mrem/yr effective dose equivalent (EDE) to the nearest member of the public. Minor point sources have a potential to emit radionuclides less than 0.1 mrem/yr EDE to the nearest member of the public. These data include annual average radionuclide concentrations emitted and total radioactive curies released.

2.1.3 Radionuclide Data Summary

Tables 2-2 and 2-3 list the numerical emissions data under a variety of column headings. The column headings and associated technical terms as used in these tables are defined and clarified in this section.

The stack identifiers are a unique number assigned to each air effluent stack and follow a regular numbering sequence. In the 200 Areas, stacks and vents are designated by a number that has a "291" or "296" prefix, depending on stack height. The "291" prefix is used exclusively for stacks that are 200 feet (61 meters) high, and the "296" prefix is used for all other, and shorter, stacks and vents. In the 100, 300, and 400 Areas, stacks and vents are usually identified with the corresponding facility number where they are located (an exception is the Cold Vacuum Drying Facility stack, 296-K-42, in the 100-K Area). Stacks in the 600 Area have the prefix of "696."

The EDP code is the electronic data processing code and represents a unique number assigned to air sampling locations for data tracking purposes.

The average operating flow rate is the average stack flow rate for the period of time the stack fan actually operates. In other words, the average operating flow rate is the total volume of effluent emitted divided by the stack operating time:

$$Average\ Operating\ Flow\ rate = \frac{total\ annual\ stack\ volume}{time\ operated\ in\ one\ year}.$$

The volume is the total volume of air emitted by the stack during the year:

$$Volume = \sum (stack\ \ flow\ rate\ measurement) \times (length\ of\ \ time\ operated\ at\ that\ \ flow\ rate).$$

The average operating concentration is the total curies emitted divided by the total volume of air emitted:

$$Average\ operating\ concentration = \frac{(Curie\ Emissions)}{(Volume)}.$$

The emissions are the calculated curies emitted during the year:

$$Emissions = \sum (sample\ conc.) \times (stack\ volume\ emitted\ during\ sample\ collection\ period).$$

Table 2-1. Radionuclide Air Emissions from Facilities Managed by BHI, CH2M HILL, and FH in 2003.

Radionuclide	Releases, Ci[a]					
	100 Areas	200 East Area	200 West Area	300 Area	400 Area	Total
^{3}H (as HT)	NM	NM	NM	NM	NM	NM
^{3}H (as HTO)	NM	NM	NM	NM	6.6 E–01	6.6 E-01
^{60}Co	0	3.9 E-08	0	0	NM	3.9 E-08
^{90}Sr	9.0 E–06	1.2 E–04	3.0 E–05	1.3 E–06	NM	1.6 E–04
^{106}Ru	1.1 E-06	0	0	0	NM	1.1 E-06
^{125}Sb	0	0	0	0	NM	0
^{129}I	NM	1.4 E–03	NM	NM	NM	1.4 E–03
^{137}Cs	7.5 E–06	6.3 E–05	1.5 E–05	2.0 E–06	4.9 E–06	9.2 E–05
^{152}Eu	0	0	0	0	NM	0
^{155}Eu	0	0	0	0	NM	0
^{234}U	NM	NM	NM	6.3 E–11	NM	6.3 E–11
^{235}U	NM	NM	NM	4.6 E–11	NM	4.6 E–11
^{238}U	NM	NM	NM	3.5 E–11	NM	3.5 E–11
^{238}Pu	3.4 E–07	3.8 E-08	1.3 E–06	4.9 E-09	NM	1.7 E–06
$^{239/240}Pu$	2.5 E–06	1.7 E–06	8.3 E–05	1.1 E-07	1.4 E–07	8.7 E–05
^{241}Pu	2.3 E–05	0	7.2 E–05	0	NM	9.5 E–05
^{241}Am	1.7 E–06	2.0 E–06	1.4 E–05	1.3 E–08	NM	1.8 E–05

[a] 1 Ci = 1 curie = 3.7 E+10 becquerels (Bq).

NM = not measured.

Table 2-2. Hanford Site Radionuclide Air Emissions from Major Point Sources in 2003.
(major point source: potential of >0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	Average operating flow rate, ft^3/min (m^3/s)	Volume, ft^3 (m^3)	Radionuclide or type of radioactivity	Average operating concentration, µCi/mL	Emissions, Ci [a]
100 Area Major Point Sources					
296-K-142	16,286	8.6E+09	^{90}Sr	1.6E-16	7.0E-08
(CVDF; FH; Y201)	(7.69)	(2.4E+08)	^{106}Ru	≤0	0
			^{137}Cs	≤0	0
			^{238}Pu	≤0	0
			$^{239/240}Pu$	8.8E-18	3.8E-09
			^{241}Pu	≤0	0
			^{241}Am	1.9E-17	8.4E-09
			total β	4.5E-16	2.0E-07
200 East Area Major Point Sources					
291-A-1	32,224	1.7E+10	^{60}Co	≤0	0
(PUREX Plant; FH; A006)	(15.21)	(4.8E+08)	^{90}Sr	3.1E-15	3.1E-06
			^{129}I	2.5E-12	1.4E-03
			^{137}Cs	1.6E-14	1.2E-05
			^{238}Pu	3.9E-17	3.8E-08
			$^{239/240}Pu$	5.6E-16	5.5E-07
			^{241}Am	2.0E-15	2.0E-06
			total α	2.5E-15	2.4E-06
			total β	1.2E-14	1.2E-05
296-A-42	701	3.5E+08	^{60}Co	≤0	0
(East Tank Farms;	(0.33)	(1.0E+07)	^{90}Sr	≤0	0
241-AY/AZ Primary;			^{129}I	≤0	0
CH2M HILL, E147)			^{137}Cs	≤0	0
			^{238}Pu	≤0	0
			$^{239/240}Pu$	1.6E-17	2.1E-10
			^{241}Am	≤0	0
			total α	9.6E-17	1.3E-09
			total β	6.9E-16	9.4E-09
296-B-1	16,547	8.7E+09	^{90}Sr	9.1E-19	2.7E-10
(B Plant; FH; B001)	(7.81)	(2.5E+08)	^{137}Cs	≤0	0
			total α	2.1E-17	6.4E-09
			total β	5.4E-17	1.6E-08
296-B-10	24,390	1.3E+10	^{90}Sr	2.3E-13	1.1E-04
(WESF; FH; B748)	(11.51)	(3.6E+08)	^{137}Cs	1.1E-13	5.1E-05
			total α	1.1E-15	4.9E-07
			total β	5.2E-13	2.4E-04

Table 2-2. Hanford Site Radionuclide Air Emissions from Major Point Sources in 2003.
(major point source: potential of >0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	**Average operating flow rate, ft^3/min (m^3/s)**	**Volume, ft^3 (m^3)**	**Radionuclide or type of radioactivity**	**Average operating concentration, µCi/mL**	**Emissions, Ci [a]**
296-B-28	206	9.4E+07	^{90}Sr	1.1E-16	4.0E-10
(West Tank Farms;	(0.10)	(2.7E+06)	^{137}Cs	8.2E-17	3.0E-10
244-BX Saltwell Receiver;			^{238}Pu	≤0	0
CH2M HILL; E886)			$^{239/240}Pu$	3.5E-18	1.3E-11
			^{241}Am	≤0	0
			total α	4.3E-16	1.6E-09
			total β	3.1E-15	1.2E-08
296-C-5 (East Tank Farms; 244-CR Vault; CH2M HILL; E069)	did not operate				
296-C-6 (East Tank Farms; CH2M HILL; E083)	did not operate				
296-H-212	8,666	4.6E+09	^{90}Sr	≤0	0
(CSB; FH; C601)	(4.09)	(1.3E+08)	^{137}Cs	≤0	0
			^{238}Pu	≤0	0
			$^{239/240}Pu$	3.4 E-17	5.2 E-09
			^{241}Am	0	0
			total α	5.3 E-16	8.2 E-08
			total β	1.7 E-15	2.7 E-07
296-P-16 (East Tank Farms; 241-C-105 & 106 Exhaust; CH2M HILL; E068)	did not operate				
296-P-32 (East Tank Farms; 244-AR Vault; CH2M-HILL; E401)	did not operate				
296-P-33 (Tank Farms; Rotary Mode Core Sample; CH2M HILL; E307)	did not operate				
296-P-34 (Tank Farms; Rotary Mode Core Sample; CH2M HILL; E308)	did not operate				

Table 2-2. Hanford Site Radionuclide Air Emissions from Major Point Sources in 2003.
(major point source: potential of >0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	Average operating flow rate, ft^3/min (m^3/s)	Volume, ft^3 (m^3)	Radionuclide or type of radioactivity	Average operating concentration, µCi/mL	Emissions, Ci [a]
296-P-44 & 296-P-45	1,000	7.8E+07	^{90}Sr	≤0	0
(Tank Farms;	(0.47)	(2.2E+06)	^{137}Cs	≤0	0
244-AR Vault;			^{238}Pu	≤0	0
CH2M HILL; E046, E047)			$^{239/240}Pu$	7.0E-19	2.1E-12
			^{241}Am	≤0	0
			total α	2.5E-16	7.7E-10
			total β	1.8E-15	5.6E-09
296-P-47	933	9.7E+07	^{60}Co	1.0E-14	3.9E-08
(Tank Farms;	(0.44)	(2.8E+06)	^{90}Sr	8.2E-13	3.1E-06
CH2M HILL; E096)			^{137}Cs	7.6E-14	2.9E-07
			^{238}Pu	≤0	0
			$^{239/240}Pu$	7.2E-16	2.7E-09
			^{241}Am	9.5E-16	3.6E-09
			total α	2.9E-15	1.1E-08
			total β	2.1E-12	7.8E-06
200 West Area Major Point Sources					
296-P-43	439	3.5E+07	^{90}Sr	≤0	0
(Tank Farms;	(0.21)	(1.0E+06)	^{137}Cs	≤0	0
244-AR Vault;			^{238}Pu	≤0	0
CH2M HILL; E045)			$^{239/240}Pu$	≤0	0
			^{241}Am	1.2E-16	1.6E-10
			Total α	4.0E-16	5.5E-10
296-S-22	121	1.3E+07	^{90}Sr	3.4E-17	1.7E-11
(West Tank Farms;	(0.06)	(3.6E+05)	^{137}Cs	≤0	0
244-S Saltwell Receiver;			^{238}Pu	≤0	0
CH2M HILL; W880)			$^{239/240}Pu$	≤0	0
			^{241}Am	≤0	0
			total α	2.2E-16	1.1E-10
			total β	2.4E-15	1.2E-09
296-T-18	260	1.3E+08	^{90}Sr	3.4E-16	1.8E-09
(West Tank Farms;	(0.12)	(3.7E+06)	^{137}Cs	1.5E-16	7.7E-10
244-TX Saltwell Receiver;			^{238}Pu	≤0	0
CH2M HILL; W882)			$^{239/240}Pu$	3.0E-17	1.6E-10
			^{241}Am	2.6E-17	1.4E-10
			total α	3.3E-16	1.7E-09
			total β	2.0E-15	1.0E-08

Table 2-2. Hanford Site Radionuclide Air Emissions from Major Point Sources in 2003.
(major point source: potential of >0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	Average operating flow rate, ft^3/min (m^3/s)	Volume, ft^3 (m^3)	Radionuclide or type of radioactivity	Average operating concentration, µCi/mL	Emissions, Ci [a]
296-W-4	15,444	8.1E+09	^{90}Sr	≤0	0
(WRAP; FH; W123)	(7.29)	(2.3E+08)	^{137}Cs	≤0	0
			^{238}Pu	≤0	0
			$^{239/240}Pu$	≤0	0
			^{241}Pu	≤0	0
			^{241}Am	≤0	0
			total α	6.5E-17	2.1E-08
			total β	3.5E-16	1.1E-07
291-Z-1	290,000	1.5E+11	^{90}Sr	8.7E-18	4.4E-08
(PFP; FH; Z810)	(136.86)	(4.3E+09)	^{137}Cs	≤0	0
			^{238}Pu	1.9E-16	9.7E-07
			$^{239/240}Pu$	1.0E-14	5.3E-05
			^{241}Pu	1.3E-14	6.3E-05
			^{241}Am	2.3E-15	1.1E-05
			total α	1.3E-14	6.6E-05
			total β	1.4E-15	7.1E-06
296-Z-3	991	5.2E+08	^{238}Pu	2.8E-15	4.6E-08
(PFP; FH; Z813)	(0.47)	(1.5E+07)	$^{239/240}Pu$	1.8E-15	3.0E-08
			^{241}Pu	2.7E-15	4.4E-08
			^{241}Am	9.8E-16	1.6E-08
			total α	5.7E-15	9.3E-08
			total β	4.6E-15	7.6E-08
296-Z-7	1,308	6.9E+08	^{90}Sr	8.5E-18	2.1E-10
(PFP; FH; Z818)	(0.62)	(1.9E+07)	^{137}Cs	≤0	0
			^{238}Pu	≤0	0
			$^{239/240}Pu$	2.1E-17	5.3E-10
			^{241}Pu	≤0	0
			^{241}Am	≤0	0
			total α	9.7E-17	2.4E-09
			total β	5.4E-16	1.4E-08

Table 2-2. Hanford Site Radionuclide Air Emissions from Major Point Sources in 2003.
(major point source: potential of >0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	Average operating flow rate, ft^3/min (m^3/s)	Volume, ft^3 (m^3)	Radionuclide or type of radioactivity	Average operating concentration, µCi/mL	Emissions, Ci [a]
300 Area Major Point Sources					
340-NT-EX	1,777	9.3E+08	^{90}Sr	≤0	0
(340 Complex; FH; F002)	(0.84)	(2.6E+07)	^{137}Cs	≤0	0
			^{234}U	2.1E-18	6.3E-11
			^{235}U	1.5E-18	4.6E-11
			^{238}U	1.2E-18	3.5E-11
			total α	4.8E-17	1.5E-09
			total β	1.8E-16	5.4E-09
EP-324-01-S	64,013	3.4E+10	^{90}Sr	≤0	0
(324 Building; FH; F025)	(30.21)	(9.5E+08)	^{137}Cs	≤0	0
			^{238}Pu	≤0	0
			$^{239/240}Pu$	3.1E-18	3.4E-09
			^{241}Am	≤0	0
			total α	≤0	0
			total β	3.1E-16	3.5E-07
EP-327-01-S	41,000	2.2E+10	^{90}Sr	2.4E-16	1.7E-07
(327 Building; FH; F026)	(19.35)	(6.1E+08)	^{137}Cs	2.9E-15	2.0E-06
			^{238}Pu	6.9E-18	4.9E-09
			$^{239/240}Pu$	1.3E-17	9.3E-09
			^{241}Am	1.9E-17	1.3E-08
			total α	1.7E-16	1.2E-07
			total β	4.3E-15	3.1E-06

General definitions: EDP = Electronic Data Processing; ft = feet; ft^3 = cubic feet; m^3 = cubic meters; min = minute; mrem = millirem; s = second; yr = year.

[a] Ci = curie; 1 Ci = 3.7 E+10 becquerels (Bq).

Table 2-3. Hanford Site Radionuclide Air Emissions from Minor Point Sources in 2003.
(minor point source: potential of ≤0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	**Average operating flow rate, ft^3/min (m^3/s)**	**Volume, ft^3 (m^3)**	**Radionuclide or type of radioactivity**	**Average operating concentration, µCi/mL**	**Emissions, Ci [a]**
100 Area Minor Point Sources					
105-KE Basin (100 K Area; FH; Y245, Y246, Y248)	31,200 (14.72)	1.6E+10 (4.6E+08)	^{90}Sr	9.2E-15	4.7E-06
			^{106}Ru	2.1E-15	1.1E-06
			^{137}Cs	1.2E-14	6.0E-06
			^{238}Pu	3.1E-16	1.6E-07
			$^{239/240}Pu$	2.3E-15	1.2E-06
			^{241}Pu	2.0E-14	1.0E-05
			^{241}Am	1.6E-15	8.1E-07
			total α	4.8E-15	2.5E-06
			total β	5.2E-14	2.6E-05
105-KW Basin (100-K Area; FH; Y234, Y235, Y236)	22,100 (10.43)	1.1E+10 (3.2E+08)	^{90}Sr	1.2E-14	4.2E-06
			^{137}Cs	4.4E-15	1.5E-06
			^{238}Pu	5.2E-16	1.8E-07
			$^{239/240}Pu$	3.8E-15	1.3E-06
			^{241}Pu	3.7E-14	1.3E-05
			^{241}Am	2.6E-15	9.2E-07
			total α	5.6E-15	1.9E-06
			total β	3.7E-14	1.3E-05
1706-KE (100-K Area; FH; Y243)	12,000 (5.66)	1.3E+08 (3.8E+06)	total α	1.7E-15	8.7E-09
			total β	4.3E-15	2.3E-08
200 East Area Minor Point Sources					
296-A-18 (East Tank Farms; 101-AY Annulus; CH2M HILL; E060)	1,296 (0.61)	6.0E+08 (1.7E+07)	total α	≤0	0
			total β	7.3E-16	1.7E-08
296-A-19 (East Tank Farms; 241-AY-102 Annulus; CH2M HILL; E061)	961 (0.45)	4.7E+08 (1.2E+07)	total α	9.0E-16	1.5E-08
			total β	1.6E-15	2.9E-08
296-A-20 (East Tank Farms; All AZ Annuli; CH2M HILL; E197)	972 (0.46)	5.1E+08 (1.4E+07)	total α	3.2E-16	5.4E-09
			total β	9.3E-16	1.6E-08
296-A-21 (242-A Evaporator; FH; E645)	14,458 (6.82)	7.6E+09 (2.2E+08)	total α	3.0E-16	8.0E-08
			total β	1.2E-15	3.2E-07

Table 2-3. Hanford Site Radionuclide Air Emissions from Minor Point Sources in 2003.
(minor point source: potential of ≤0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	**Average operating flow rate, ft^3/min (m^3/s)**	**Volume, ft^3 (m^3)**	**Radionuclide or type of radioactivity**	**Average operating concentration, µCi/mL**	**Emissions, Ci [a]**
296-A-22	500	2.6E+08	^{60}Co	≤0	0
(242-A Evaporator; FH; E643)	(0.24)	(7.4E+06)	^{90}Sr	≤0	0
			^{137}Cs	≤0	0
			^{238}Pu	≤0	0
			$^{239/240}Pu$	≤0	0
			^{241}Am	9.2E-18	8.6E-11
			total α	2.2E-16	2.1E-09
			total β	4.1E-15	3.8E-08
296-A-26 (East Tank Farms; 204-AR Bldg.; CH2M HILL; E297)	1,755	9.1E+08	total α	≤0	0
	(0.83)	(2.6E+07)	total β	5.4E-16	1.9E-08
296-A-27 (East Tank Farms; 241-AW Primary Exhaust; CH2M HILL; E270)	1,013	5.2E+08	total α	9.7E-17	2.8E-09
	(0.48)	(1.5E+07)	total β	5.4E-15	1.5E-07
296-A-28 (East Tank Farms; 241-AW Tank Farm Annuli; CH2M HILL; E272)	6,041	3.1E+09	total α	3.1E-16	5.8E-08
	(2.85)	(8.8E+07)	total β	2.2E-15	4.2E-07
296-A-29 (East Tank Farms; 241-AN Primary Exhaust; CH2M HILL; E901)	749	3.8E+08	total α	1.4E-14	2.9E-07
	(0.35)	(1.1E+07)	total β	2.5E-14	5.1E-07
296-A-30 (East Tank Farms; 241-AN Tank Farm Annuli; CH2M HILL; E903)	5,571	2.5E+09	total α	3.3E-16	4.2E-08
	(2.63)	(7.1E+07)	total β	2.1E-15	2.7E-07
296-A-40 (East Tank Farms; 241-AP Primary Exhaust; CH2M HILL; E013)	823	4.3E+08	total α	7.9E-17	1.2E-09
	(0.39)	(1.2E+07)	total β	1.5E-15	2.2E-08
296-A-41 (East Tank Farms; 241-AP Tank Farm Annuli; CH2M HILL; E015)	7,929	4.1E+09	total α	5.5E-17	8.0E-09
	(3.74)	(1.2E+08)	total β	4.4E-16	6.3E-08
296-A-43 (East Tank Farms; 241-AZ-702 Bldg.; CH2M HILL; E148)	776	4.0E+08	total α	≤0	0
	(0.37)	(1.1E+07)	total β	≤0	0
296-E-1 (ETF; FH; E036)	58,763	3.1E+10	total α	9.7E-17	1.2E-07
	(27.73)	(8.7E+08)	total β	4.2E-16	5.1E-07
296-P-31 (209-E; FH; E209)	1,196	6.3E+08	total α	≤0	0
	(0.56)	(1.8E+07)	total β	2.2E-15	4.3E-08

Table 2-3. Hanford Site Radionuclide Air Emissions from Minor Point Sources in 2003.
(minor point source: potential of ≤0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	**Average operating flow rate, ft^3/min (m^3/s)**	**Volume, ft^3 (m^3)**	**Radionuclide or type of radioactivity**	**Average operating concentration, µCi/mL**	**Emissions, Ci[a]**
200 West Area Minor Point Sources					
291-S-1 (REDOX Plant; FH; S006)	21,635 (10.21)	1.1E+10 (3.2E+08)	total α total β	5.8E-16 1.3E-15	2.6E-07 5.8E-07
296-P-22 (West Tank Farms; 241-SY Tank Farm Annuli; CH2M HILL; W191)	712 (0.34)	3.6E+08 (1.0E+07)	total α total β	1.3E-16 4.8E-16	1.6E-09 6.1E-09
296-S-7E (REDOX Plant; FH; S015; *and Backup: S016)* **EU-1** (formerly 296-S-7W)	5,425 (2.56)	2.3E+09 (6.5E+07)	^{90}Sr ^{137}Cs ^{238}Pu $^{239/240}Pu$ ^{241}Pu ^{241}Am total α total β	1.8E-17 ≤0 2.4E-16 5.1E-15 1.4E-14 3.4E-15 7.5E-15 1.7E-15	1.6E-09 0 2.1E-08 4.5E-07 1.2E-06 3.0E-07 6.6E-07 1.5E-07
296-S-15 (West Tank Farms; 241-SX Primary Exhaust; CH2M HILL; W111)	3,865 (1.82)	1.5E+09 (4.4E+07)	^{90}Sr ^{137}Cs ^{238}Pu $^{239/240}Pu$ ^{241}Am total α total β	≤0 2.5E-16 ≤0 ≤0 ≤0 7.1E-17 2.2E-15	0 1.3E-08 0 0 0 3.7E-09 1.2E-07
296-S-16 (222-S; FH; S264)	55 (0.03)	2.9E+07 (8.2E+05)	total α total β	8.2E-16 7.4E-15	9.2E-10 8.3E-09
296-S-18 (West Tank Farms; 242-S Evaporator Bldg.; CH2M HILL; W096)	4,284 (2.02)	2.7E+08 (7.5E+06)	total α total β	1.1E-15 2.9E-15	1.2E-08 3.2E-08
296-S-21 (222-S; FH; S289)	74,386 (35.11)	3.9E+10 (1.1E+09)	total α total β	≤0 3.7E-16	0 5.6E-07
296-S-25 (West Tank Farms; 241-SY Primary Exhaust; CH2M HILL; W145; 296-P-23, W190;	886 (0.42)	4.6E+08 (1.3E+07)	^{90}Sr ^{137}Cs ^{238}Pu $^{239/240}Pu$ ^{241}Am total α total β	5.4E-17 ≤0 ≤0 ≤0 ≤0 7.0E-17 9.5E-16	9.8E-10 0 0 0 0 1.2E-09 1.7E-08

Table 2-3. Hanford Site Radionuclide Air Emissions from Minor Point Sources in 2003.
(minor point source: potential of ≤0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	**Average operating flow rate, ft^3/min (m^3/s)**	**Volume, ft^3 (m^3)**	**Radionuclide or type of radioactivity**	**Average operating concentration, µCi/mL**	**Emissions, Ci[a]**
291-T-1 (T Plant; FH; T785)	40,000 (18.88)	2.1E+10 (6.0E+08)	^{90}Sr	2.4E-14	1.8E-05
			^{137}Cs	2.0E-14	1.5E-05
			^{238}Pu	3.6E-16	2.7E-07
			$^{239/240}Pu$	4.0E-14	3.0E-05
			^{241}Pu	9.4E-15	7.1E-06
			^{241}Am	2.6E-15	2.0E-06
			total α	5.4E-14	4.0E-05
			total β	9.8E-14	7.4E-05
296-T-7 (T Plant; FH; T154)	11,366 (5.36)	2.0E+08 (5.5E+06)	total α	≤0	0
			total β	6.9E-16	5.4E-09
296-T-17 (West Tank Farms; 242-T Evaporator Vessel Vent Exhaust; CH2M HILL; W117)	1,151 (0.54)	3.8E+08 (1.1E+07)	total α	≤0	0
			total β	3.0E-16	4.0E-09
291-U-1 (U Plant; FH; U771)	21,418 (10.11)	1.1E+10 (3.2E+08)	total α	≤0	0
			total β	2.2E-14	9.7E-06
296-W-3 (West Tank Farms; 213-W Exhauster; CH2M HILL; W003)	did not operate				
296-Z-5 (PFP; FH; Z913)	8,828 (4.17)	4.6E+09 (1.3E+08)	total α	2.1E-16	3.8E-08
			total β	1.2E-15	2.1E-07
296-Z-6 (PFP; FH; Z802)	7,298 (3.44)	3.8E+09 (1.1E+08)	total α	≤0	0
			total β	1.9E-16	2.9E-08
296-Z-14 (PFP; FH; Z814)	1,766 (0.83)	9.3E+08 (2.6E+07)	total α	3.5E-16	1.3E-08
			total β	8.9E-16	3.2E-08
296-Z-15 (PFP; FH; Z915)	1,309 (0.62)	6.9E+08 (1.9E+07)	total α	≤0	0
			total β	≤0	0
300 Area Minor Point Sources					
340-B (340 Complex; FH; F008)	did not operate				
340-DECON (340 Complex; FH; F009)	7,768 (3.67)	4.1E+09 (1.2E+08)	total α	5.9E-16	9.4E-08
			total β	4.9E-15	7.7E-07
EP-327-02-V (327 Building; FH; F027)	618 (0.29)	3.2E+08 (9.2E+06)	total α	≤0	0
			total β	4.5E-16	4.7E-09
RCF-2-EX (MO-423; BHI; Y216)	580 (0.27)	2.3E+08 (6.4E+06)	total α	≤0	0
			total β	2.5E-16	2.2E-09

Table 2-3. Hanford Site Radionuclide Air Emissions from Minor Point Sources in 2003.
(minor point source: potential of ≤0.1 mrem/yr EDE to nearest public receptor)

Stack (facility; contractor; EDP code)	**Average operating flow rate, ft^3/min (m^3/s)**	**Volume, ft^3 (m^3)**	**Radionuclide or type of radioactivity**	**Average operating concentration, µCi/mL**	**Emissions, Ci [a]**
400 Area Minor Point Sources					
437-1-61 (MASF; FH; F019)	14,595	7.7E+09	total α	≤0	0
	(6.89)	(2.2E+08)	total β	≤0	0
437-MN&ST (MASF; FH; F014)	13,770	7.2E+09	total α	≤0	0
	(6.50)	(2.0E+08)	total β	2.9E-15	9.0E-07
FFTF-CB-EX (FFTF; FH; F011, F024)	20,560	1.1E+10	^3H	1.9E-09	6.6E-01
	(9.70)	(3.1E+08)	total α	3.0E-16	1.2E-07
			total β	4.1E-15	1.7E-06
FFTF-HT-TR (FFTF; FH; F013)	5,020	2.6E+09	total α	2.0E-16	2.0E-08
	(2.37)	(7.5E+07)	total β	5.0E-15	5.1E-07
FFTF-RE-SB (FFTF; FH; F012)	12,016	6.3 E+09	total α	≤0	0
	(5.67)	(1.8 E+08)	total β	7.3E-15	1.8E-06
600 Area Minor Point Sources					
696-W-1 (WSCF; FH; W010)	48,638	2.6E+10	total α	≤0	0
	(22.95)	(7.2E+08	total β	2.7E-16	2.7E-07
696-W-2 (WSCF; FH; W011)	1,391	7.3E+08	total α	≤0	0
	(0.66)	(2.1E+07	total β	2.7E-16	7.7E-09

General definitions: EDP = Electronic Data Processing; ft = feet; ft^3 = cubic feet; m^3 = cubic meters; min = minute; mrem = millirem; s = second; yr = year.

[a] Ci = curie; 1 Ci = 3.7 E+10 becquerels (Bq).

2.2 NONRADIOACTIVE AIR EMISSIONS

Nonradioactive air emissions discharged in calendar year 2003 were from the following areas and facilities: package boilers in the 200 and 300 Areas; East Tank Farms; West Tank Farms, 242-A Evaporator; 200 Area ETF, and internal combustion engines (500 Horsepower and greater). Emission data are in Table 2-4.

Combustion source emissions such as package boilers and internal combustion engines were estimated by applying formulas approved by the EPA (EPA 450/4-90–003) with information on the type and quantity of fuel consumed. Table 2-5 gives a summary of the type and quantity of fuel consumed by the package boilers and internal combustion engines. Emissions of toxic air pollutants were estimated by calculation, utilizing sample measurements and/or process knowledge.

Table 2-4. Nonradioactive Air Emissions from the Hanford Site during 2003.

Source (contractor[b])	Annual Emissions[a] (kg)							
	Particulate Matter	Nitrogen Oxides (NO_x)	Sulfur Oxides (SO_x)	Carbon Monoxide	Lead	Volatile Organic Compounds	Ammonia	Toxic air pollutants
WAC 173-400-105 Reported Emission Units								
Emission Pt. No. 22: Tank Farms 200E Composite (CH2M HILL)	0	9.4 E+00	1.8 E+01	2.4 E+02	0	4.9 E+03	8.3 E+03	6.0 E+03
Emission Pt. No. 23: Tank Farms 200W Composite (CH2M HILL)	0	1.5 E+01	2.0 E+01	2.2 E+01	0	1.3 E+03	7.4 E+03	1.8 E+03
Emission Pt. No. 24: 242-A Evaporator 200E Area (FH, CH2M HILL)	0	0	0	0	0	0	5.9 E+02	2.5 E+02
Emission Pt. No. 25: Effluent Treatment 200E Area (FH)	0	0	0	0	0	0	0	7.7 E+00
Emission Pt. No. 26: ESPC[c] Distillate-Oil Boilers 200 Area Composite (JCI)	1.1 E+03	1.1 E+04	3.6 E+03	5.1 E+03	6.4 E-01	9.3 E+02	0	0
Emission Pt. No. 27: ESPC[c] Natural-Gas Boilers 300 Area Composite (JCI)	5.4 E+02	2.2 E+03	2.7 E+01	1.0 E+04	0	5.8 E+02	0	0
Emission Pt. No. 28: CWC[d] Diffuse and Fugitive 200W Area (FH)	0	0	0	0	0	0	0	0
Emission Pt. No. 30: T Plant[d] 200W Area (FH)	0	0	0	0	0	0	0	0

Table 2-4. Nonradioactive Air Emissions from the Hanford Site during 2003.

Source (contractor[b])	Annual Emissions[a] (kg)							
	Particulate Matter	Nitrogen Oxides (NO_x)	Sulfur Oxides (SO_x)	Carbon Monoxide	Lead	Volatile Organic Compounds	Ammonia	Toxic air pollutants
Emission Pt. No. 31: WRAP[d] 200W Area (FH)	0	0	0	0	0	0	0	0
Emission Pt. No. 32: Fuel Dispensing, Evaporative Losses 200/600 Area (Conoco)	0	0	0	0	0	3.4 E+3	0	0
Other Air Operating Permit Listed Emission Units								
200E E-225BC 001 (FH)	1.2 E+01	3.7 E+02	5.9 E+00	9.9 E+01	0	1.2 E+01	0	0
200E E-225BG 001 (FH)	7.8 E-01	2.5 E+01	3.9 E-01	6.6 E+00	0	7.8 E-01	0	0
200E E-282ED 001 (FH)	7.2 E+00	2.3 E+02	3.6 E+00	6.1 E+01	0	7.2 E+00	0	0
200W E-282WD 001 (FH)	4.5 E+00	1.4 E+02	2.3 E+00	3.8 E+01	0	4.5 E+00	0	0
300 E-900 001 (FH)	Did Not Operate							
300 E-900 002 (FH)	Did Not Operate							
300 E-900 003 (FH)	Did Not Operate							
300 E-1000 001 (FH)	4.0 E+00	1.3 E+02	2.0 E+00	3.4 E+01	0	4.0 E+00	0	0
300 E-1450 001 (FH)	4.0 E+00	1.3 E+02	2.0 E+00	3.4 E+01	0	4.0 E+00	0	0
400 E-1500 001, DG-1 (FH)	Did Not Operate							
400 E-1500 002, DG-2 (FH)	Did Not Operate							
400 E-4250 001, G-3 (FH)	0	1.1E+02	1.6 E+01	3.9 E-01	0	4.8 E-01	0	0
400 E-408 A/B/C -1/2/3/4 (Q1-Q12) (FH)	0	5.4 E+01	4.9 E+01	0	0	5.4 E-01	0	0
600 E WSCF 001 (FH)	2.5 E+00	8.0 E+01	1.3 E+00	2.1 E+01	0	2.5 E+00	0	0
Permitted Emission Units Awaiting Inclusion in AOP								
JCI Standby[e] Generators	1.1 E+01	2.3 E+02	6.0 E+01	8.5 E+00	0	1.8 E+00	0	0
200W Z Plant Polycube Thermalization Process	0	0	0	4.53 E+02[f]	0	0	0	1.0 E+01[f]

[a] Emissions calculated using release factors from EPA 450/4-90–003.

[b] CH2M HILL = CH2M HILL Hanford Group, Inc.; FH = Fluor Hanford; JCI = Johnson Controls Inc.

[c] ESPC = Energy Savings Performance Contract.

[d] Emissions calculated to be less than 453 kg (1000 lbs).

[e] Emissions calculated using release factors from Notice of Construction.

[f] Emissions estimated from Notice of Construction inventory calculations.

Table 2-5. Fuel Consumed by Boilers and Internal Combustion Engines In Calendar Year 2003.

Source	Fuel consumed	
	Distillate oil, gal (L)	Natural gas, ft^3 (m^3)
Oil-fired boilers (FH, JCI, BNI)	1.1 E+06 (4.3 E+06)	N/A
Natural-gas-fired boilers (FH, JCI)	N/A	9.6 E+07 (2.7 E+06)
Internal Combustion Engines (>500 Hp) (BNI, FH, JCI)	2.2 E+04 (8.5 E+04)	N/A

BNI = Bechtel National Inc., FH = Fluor Hanford, JCI = Johnson Controls Inc.

3.0 LIQUID EFFLUENTS

Calendar year 2003 radioactive and nonradioactive liquid effluents were discharged to the ground and to the Columbia River from BHI, CH2M HILL, BNI, and FH managed facilities and activities. All discharges were in accordance with the requirements of state and federal discharge permits. By August 1997, all 200 Area significant liquid effluent discharges to the ground were either discontinued or rerouted to the 200 Area TEDF. Significant wastewater streams from the Plutonium Finishing Plant, T Plant, PUREX Plant, B Plant, 242-A-81 Building, and 283-E and 283-W Water Treatment Plants were rerouted to the 200 Area TEDF. Other rerouted streams consist of steam condensate and cooling water from the 242-A Evaporator, 241-A Tank Farm, 244-AR Vault, and B Plant. Reporting on individual contributory liquid effluent streams is no longer required. Data are reported on the collective effluent discharged to the two 200 Area TEDF disposal basins.

Beginning in November 1995, the ETF began treating 242-A Evaporator process condensate, which previously had been discharged directly to the ground. The ETF also treats other radioactive liquids generated at the Hanford Site, such as groundwater from the UP-1 Operable Unit and wastewater from the 222-S Laboratory retention basins when the effluent will not meet 200 Area TEDF acceptance criteria. The ETF treats liquid waste by filtration, ultraviolet oxidation, pH adjustment, and reverse osmosis before they are sampled, analyzed, and approved for discharge to the State Approved Land Disposal Site (SALDS). Reporting on individual contributory liquid effluent streams is no longer required. Data are reported on the collective effluent discharged from the ETF.

Table 3-1 lists the permitted discharge points active in calendar year 2003.

3.1 DISCHARGES TO COLUMBIA RIVER

Liquid effluents discharged to the Columbia River from the 100–K and 300 Areas were regulated in accordance with NPDES permit WA-002592-7 for the Hanford Site.

Table 3-2 presents radionuclide release data by individual liquid effluent stream. A tabulation of NPDES regulated discharge parameters are in Table 3-3 and Table 3-4. Combined totals of radionuclides discharged to the Columbia River are in Table ES-2 of the Executive Summary.

3.1.1 1908-K Outfall

The 1908-K Outfall (NPDES discharge number: 004) located in the 100-K area, discharges potentially hazardous chemical and radioactive substances to the Columbia River. The 100-K Intake Screen Wash Water (NPDES discharge number 003) did not operate during 2003. NPDES permit monitoring and analytical data parameters are in Table 3-3.

3.1.2 300 Area Treated Effluent Disposal Facility

The 300 Area TEDF (NPDES discharge number: 001) treats wastewater prior to discharge to the Columbia River. In 2003, all 300 Area nonradioactive liquid effluents were routed to the 300 Area TEDF for treatment prior to discharge. NPDES permit monitoring and analytical data parameters are in Table 3-4.

3.1.3 N Springs

Historically, 100-N radioactive effluent streams were sent to the 1301-N and 1325-N Liquid Waste Disposal Facilities (LWDFs). These discharges to the ground contributed to the release of radionuclides to the Columbia River through their migration with the groundwater. Radionuclides from these facilities enter the Columbia River along the riverbank region commonly called N Springs. Estimates of N Springs radionuclide contribution to the Columbia River in calendar year 2003 are contained in Table 3-2.

Riverbank springs and/or shoreline seepage wells along the 100-N Area shoreline are sampled annually to verify that the reported radionuclide release to the Columbia River are not underreported. The amount of radionuclides entering the river at these springs is calculated based on analyses of samples routinely collected from monitoring well 199-N-46, located near the shoreline. To calculate these releases, radionuclide concentrations in samples collected from well 199-N-46 are multiplied by the estimated groundwater discharged into the river. The estimated groundwater flow rate used to calculate 2003 releases from the springs was 43 L/min (11 gal/minute). The results of the annual riverbank spring samples can then be compared to the concentrations measured in well 199-N-46 to ensure that concentrations in the well reflect the highest concentration of radionuclides in the groundwater. Additional discussion of the annual shoreline sampling effort may be found in *Hanford Site Near-Facility Environmental Monitoring Data Report for Calendar Year 2003* (PNNL-14687, APP. 2).

3.2 STATE PERMITTED DISCHARGES TO GROUND

State Waste Discharge Permits govern all Hanford Site liquid effluent streams discharged to the ground. The permitted streams are listed in Table 3–1 and described in succeeding sections.

3.2.1 200 Area Effluent Treatment Facility

The 200 Area Effluent Treatment Facility (ETF) discharges treated wastewater. The discharges are regulated in accordance with State Waste Discharge Permit ST 4500. Permit specified monitoring and analytical data parameters are in Table 3-5.

3.2.2 200 Area Treated Effluent Disposal Facility

The 200 Area TEDF discharges treated wastewater to the ground. The facility consists of a piping network that conveys wastewater from numerous other facilities on the Hanford Site to two 5-acre disposal basins located near the facility. Discharges from the 200 Area TEDF are regulated in accordance with State Waste Discharge Permit ST 4502. Permit specified monitoring and analytical data parameters are in Table 3-6. The discharges routinely meet state drinking water standards.

3.2.3 400 Area Secondary Cooling Water

The 400 Area Secondary Cooling Water Stream discharges cooling water from the secondary cooling loop of the Fast Flux Test Facility (FFTF) Cooling Towers. This stream is regulated in accordance with State Waste Discharge Permit ST 4501. Permit ST 4501 was re-issued in September 2003 with different monitoring and report requirements. The required monitoring include only three parameters and the requirement to monitor groundwater wells was eliminated. Permit specified monitoring and analytical data parameters are in Table 3-7.

3.2.4 100-N Sewage Treatment Lagoon

The 100-N Sewage Treatment Lagoon treats sewage from the 100-N, 100-K, and 200 Areas. Domestic wastewater from the 100-N Sewage Treatment Lagoon is discharged to ground in accordance with State Waste Discharge Permit ST 4507. Leachate from residual solids and from radioactive waste is not sanctioned by the permit. Permit specified monitoring and analytical data parameters are in Table 3-8.

3.2.5 Hydrotest, Maintenance, and Construction Discharges

Wastewater discharges to soil as a result of hydrotests, maintenance, and construction activities, regulated in accordance with State Waste Discharge Permit ST 4508, occur at numerous locations throughout the Hanford Site. Sampling the discharges is not required as long as compliance is maintained with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3).

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) project under the direction of BNI, discharges hydrotest, maintenance, and construction water to ground in volumes that exceed ST 4508 limits in accordance with State Waste Discharge Permit ST 9240. Sampling the discharges is not required as long as compliance is maintained with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3).

3.2.6 Cooling Water and Steam Condensate Discharges

Cooling water and steam condensate discharges, regulated in accordance with State Waste Discharge Permit ST 4509, occur at numerous locations throughout the Hanford Site. Sampling the discharges is not required as long as compliance is maintained with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3).

3.2.7 Stormwater Discharges

Industrial stormwater discharges collected in engineered structures and then discharged to engineered structures occur at numerous locations throughout the Hanford Site. Stormwater discharges are regulated in accordance with State Waste Discharge Permit ST 4510, issued on April 1, 1999. Sampling the discharges is not required as long as compliance is maintained with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3).

The NPDES Stormwater Multi-Sector General Permit (MSGP) provides coverage for storm water discharges associated with industrial activates as defined in 40 CFR 122.26(b)(14). Specific guidance on the requirements of the MSGP are found in 65 Federal Register 210 dated October 30, 2000 and MSGP Permit #WAR05A45F. Through evaluation of the MSGP HNF-4081, *National Pollutant Discharge Elimination System Storm Water Prevention Plan for 100 K Area Outfall* dated March 1999, and historical activities of the 100 K Area operations, a determination was made that the MSGP regulations for Steam Electric Power Generating Facilities applies to the 100 K outfall storm water discharges.

3.2.8 WTP Pit 30 and Concrete Batch Plant Operations

The WTP discharges process, dewatering, and storm water to the ground at two locations in the 200 East Area of the Hanford Site. Discharges occur at Pit 30 in accordance with permit number WAG 50-5181 and at the Concrete Batch Plant in accordance with permit number WAG 50-5180. Permit specified monitoring and analytical data parameters are in Table 3-9.

3.3 SANITARY SEWAGE DISCHARGES TO GROUND

Various facilities discharged sanitary sewage during 2003. In the 100-N Area, sanitary wastewater was discharged to the 100-N Sewage Treatment Lagoon, permitted temporary holding tanks, and to five septic tanks. In the 100-DR and 100-K Areas, sanitary sewage was discharged to permitted temporary holding tanks, septic tanks and drain fields, with a portion of the sewage in the 100-K Areas collected in and delivered by tanker truck to the 100-N Sewage Treatment Lagoon.

In the 200 and 600 Areas, sanitary wastewater was discharged to a system of permitted holding tanks, septic tanks and drain fields. Sludge was pumped from septic tanks in the 200 and 600 Areas and taken to the 100-N Sewage Treatment Lagoon for disposal.

In the 300 Area, sanitary sewage was discharged to the City of Richland POTW. In the 400 Area, sanitary sewage was discharged to the Columbia Generating Station sewage treatment plant.

The estimated volume of sewage discharged to ground by WTP during 2003 is 4.5 E+06 gallons per year (1.7 E+07 liters per year). The volume of sanitary sewage discharges are estimated by multiplying an estimated average number of people assigned to WTP (1,200) times 15 gallons per day (57 liters per day) times 250 work days per year. .

The estimated total volume of sewage discharged (gallons per year) in each operating area during 2003 is shown in Table 3-10. All sanitary sewer discharges are estimated by multiplying the total number of personnel stationed in each area by 15 gallons per day per person (57 Liters per day per person) and by 250 business days in 2003.

Table 3-1. National Pollutant Discharge Elimination System and State Permitted Discharge Points Active in 2003.

Designation	Description
NPDES Discharge Points	
001	300 Area Treated Effluent Disposal Facility (TEDF)
003	100-K Intake Screen Wash Water (did not operate during 2003)
004	1908-K Outfall
004	Multi Sector General Permit Storm Water Discharge Permit
State Permitted Discharge Points	
ST 4500	200 Area Effluent Treatment Facility (ETF)
ST 4501	400 Area Secondary Cooling Water
ST 4502	200 Area Treated Effluent Disposal Facility (TEDF)
ST 4507	100-N Sewage Lagoon
ST 4508	Hydrotest, Maintenance, and Construction Discharges
ST 4509	Cooling Water and Steam Condensate Discharges
ST 4510	Industrial Stormwater Discharges
ST 9240	WTP Hydrostatic Discharges
WAG 50-5180	WTP Concrete Batch Plant Sand and Gravel General Permit
WAG 50-5181	WTF Pit 30 Sand and Gravel General Permit

Table 3-2. Radionuclides in Liquid Effluents Discharged to the Environment in 2003.

Liquid effluent stream (EDP code)[a]	Discharge location	Total flow, gal (L)	Radionuclide or type of radioactivity	Average concentration, μCi/mL[b]	Annual release, Ci[b]
100 Area Discharges to the Columbia River					
N-Springs (Y101)	Columbia River	5.8 E+06 (2.2 E+07)	^{3}H	6.7 E–07	1.5 E–02
			^{90}Sr	4.2 E–06	9.3 E–02
NPDES Outfall 004, 100-K 1908-K Outfall (Y130)	Columbia River	6.8 E+07 (2.6 E+08)	^{3}H	≤0	0
			^{60}Co	≤0	0
			^{90}Sr	2.9 E–09	8.4 E–04
			^{238}Pu	1.3 E-12	3.8 E-07
			$^{239/240}Pu$	2.5 E–11	7.1 E–06
			^{241}Am	≤0	0
			total α	≤0	0
			total β	≤0	0
Discharges to Ground in the 600 Area					
200 Area Effluent Treatment Facility (H129)	616-A Crib (SALDS)[c]	2.6 E+07 (9.8 E+07)	^{3}H	5.0 E–05	4.9 E+00

[a] EDP code = electronic data processing code, which identifies the sampler.

[b] Ci = curie; 1 Ci = 3.7 E+10 becquerels (Bq); 1 μCi/mL = 3.7 E+10 Bq/m^3.

[c] SALDS is immediately north of the 200 West Area.

Table 3-3. 1908-K Outfall (004) National Pollutant Discharge System Effluents Released to the Columbia River in 2003.

Sample Parameter	Month											
	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
Flow rate (MGD)	0.40	0.11	NOD	0.07	0.1	0.26	0.37	0.31	0.26	0.39	0.09	0.12
Temperature (°F)	49	47	-	54	60	63	63	70	68	64	52	49
pH (maximum)	8.1	7.7	-	8.0	8.1	8.3	8.2	8.3	8.5	8.7	8.2	8.1
Total suspended solids (lb/day)[a]	NOD	NOD	NOD	NOD	NOD	NOD	NOD	NOD	NOD	NOD	NOD	8.46
Total suspended solids (mg/L)[a]	NOD	NOD	NOD	NOD	NOD	NOD	NOD	NOD	NOD	NOD	NOD	2.2
Chlorine (mg/L)	IDL	IDL	IDL	IDL	0.0025	IDL	IDL	IDL	IDL	IDL	IDL	0.002

NOD = No Outfall Discharge; IDL = Instrument Detection Limit; MGD = Million Gallons per day; °F = degrees Farenheit; lb/day = pounds per day; mg/L = milligrams per liter.

[a] Total suspended solids is measured at the filter plant backwash water (per NPDES permit) before mixing at the 004 Outfall.

Table 3-4. 300 Area TEDF (001) National Pollutant Discharge System Effluents Released to the Columbia River in 2003. (2 sheets)

Sample Parameter	Month											
	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
Temperature (°F)	58	57	60	65	65	74	84	85	81	73	62	56.5
pH (maximum)	7.3	7.3	7.1	7.2	7.3	7.0	7.0	7.1	7.0	7.0	7.1	7.0
Total suspended solids (µg/L)	0	1000	0	0	0	0	0	0	0	0	0	0
Nitrogen (as ammonia) (µg/L)	26.4	0	0	0	0	0	0	0	0	0	0	0
Arsenic (µg/L)	0	0	0	0	0	0	0.19	0	0.21	0	1.68	0.11
Iron (µg/L)	11.4	0	0	0	0	0	0	0	0	0	0	0
Selenium (µg/L)	0	0	0	0	0	0	0	0.22	0.21	0	0	0
Beryllium (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
Nickel (µg/L)	0.72	0.80	0.56	0.85	0.37	1.41	0	1.0	0	0.42	2.26	1.55
Silver (µg/L)	0	0	0	0	0	0	0.47	0.63	0.33	0.17	0	0
Zinc (µg/L)	0	3.51	0	3.40	0	0	0	5.89	0	0	0	2.89
Aluminum (µg/L)	0	0	7.4	0	8.1	8.95	9.80	12.3	0	0	40.70	23.85
Cadmium (µg/L)	0	0	0	0	0	0	0	0	0.07	0	0.21	0
Lead (µg/L)	0	0	0	0	0	0	0	0	0	0	3.85	0
Copper (µg/L)	6.67	5.49	7.73	4.89	4.83	3.27	2.92	3.38	1.95	6.44	5.17	4.43
Radium (pCi/L)	0	0	0	0	0	0	0	0	0	0	0	0
Manganese (µg/L)	0	0	0	0	0	0.2	0	0	0	0	0.81	0.1
Dichlorobromomethane (µg/L)	0	0	0	0	0.29	0	0	0	0	0	0	0
Chloroform (µg/L)	4.1	3.7	5.9	7.05	7.2	7.3	8.05	6.55	4.4	3.75	3.4	4.65
Toluene (µg/L)	0	0.67	0	0.80	0.31	0.26	0	0.25	0	0	0	0
Methylenechloride (µg/L)	0.75	0.90	0.85	1.85	0.80	1.75	0.8	0	0	0	0	0
Tetrachloroethylene (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
1,1-Dichloroethane (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
1,1,1-Trichloroethane (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0

Table 3-4. 300 Area TEDF (001) National Pollutant Discharge System Effluents Released to the Columbia River in 2003. (2 sheets)

Sample Parameter	Month											
	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
Bis(2-ethylhexyl)phthalate (µg/L)	0	0	0	0	9.5	1.90	2.95	6.0	10.0	1.6	0	0
Trichloroethylene (µg/L)	0	0	0	0	0	0	0	0	0.6	0	0	0
Flow rate (MGD)	0.207	0.169	0.164	0.200	0.191	0.201	0.286	0.266	0.257	0.175	0.213	0.212
Nitrite (NO2) (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
Mercury (µg/L)	0	0.03	0	0	0.04	0.04	0.02	0.02	0	0	0.03	0
Cyanide (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
Gross Alpha (pCi/L)	0.72	2.43	0.60	0	1.23	0.51	0.37	0	0	0	0	0
Gross Beta (pCi/L)	2.31	2.28	0.0	2.52	2.27	0	1.19	0.9	4.38	0.9	1.06	3.63

°F = degrees Farenheit; mg/L = milligrams per liter; µg/L = micrograms per liter; MGD = million gallons per day; pCi/L = picocuries per liter.

Table 3-5. 200 Area Effluent Treatment Facility Discharge Monitoring Report Effluents (ST 4500) in 2003. (2 sheets)

Sample parameter	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Effluent Flow Rate (Gal/Mo)	1,923,300	1,946,7000	2,616,300	3,268,000	3,141,000	1,156,700	3,825,000	1,300,000	1,862,000	608,000	963,000	3,272,000
Specific Conductivity (µmhos/cm)	0.73	0.82	0.85	1.04	1.00	1.19	1.2	0.88	1.1	1.48	0.67	0.83
Total Suspended Solids (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	1000	NQ	NQ	NQ
Nitrate (As N) (µg/L)	8.9	NQ	NQ	NQ	NQ	NQ	NQ	NQ	ND	NQ	NQ	NQ
Total Organic Carbon (µg/L)	NQ	NQ	283	NQ	68	14	170	390	930	400	NQ	62
Chloride (µg/L)	NQ	NQ	NQ	8.0	NQ	NQ	17	10	30	30	60	NQ
Sulfate (µg/L)	NQ	NQ	42.7	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Arsenic (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	2.32	NQ	NQ
Beryllium (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Cadmium (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	0.19	NQ	NQ
Chromium (µg/L)	0.49	1.0	0.85	0.68	0.66	NQ	NQ	0.54	NQ	3.2	0.52	0.56
Copper (µg/L)	NQ	NQ	NQ	1.63	NQ	0.92	NQ	NQ	NQ	NQ	NQ	NQ
Lead (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	3.5	NQ	NQ
Gross Beta (pCi/L)	1.2	NQ	0.33	0.64	0.14	NQ	0.18	0.37	NQ	1.0	NQ	0.78
Strontium-90 (pCi/L)	0.9	1.0	1.2	NQ	1.1	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Carbon Tetrachloride (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Chloroform (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Benzene (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Methylene Chloride (µg/L)	NQ	NQ	NQ	NQ	7.1	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Tetrachloroethylene (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Total Dissolved Solids (µg/L)	NQ	NQ	11,000	NQ	NQ	10,000	NQ	NQ	NQ	NQ	NQ	NQ
Nitrite (As N) (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Mercury (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	0.58
N-Nitrosodimethylamine (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ

Table 3-5. 200 Area Effluent Treatment Facility Discharge Monitoring Report Effluents (ST 4500) in 2003. (2 sheets)

Sample parameter	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Acetophenone (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Tetrahydrofuran (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ
Gross Alpha (pCi/L)	NQ	NQ	0.20	0.22	NQ	NQ	0.11	0.18	NQ	0.65	NQ	0.42
Tritium (pCi/L)	557	237	770	736	636	760	650	830	370,000	410,000	400,000	41,000
Ammonia (As N) (µg/L)	NQ	NQ	NQ	14.6	NQ	NQ	NQ	NQ	NQ	4.4	9.4	NQ
Uranium (Total) (µg/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	0.28	NQ
Technetium-99 (pCi/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ

ND = No discharge; NQ = Not quantifiable; Gal/Mo = gallons per month; µmhos/cm = micro mho per centimeter; µg/L = micro grams per liter .

Table 3-6. 200 Area TEDF Discharge Monitoring Report Effluents (ST 4502) in 2003.

Sample parameter	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Conductivity (µhoms/cm)	161	121	168	155	168	142	151	169	163	158	199	199
PH (maximum)	8.76	8.61	8.3	8.04	8.27	8.75	9.43	8.62	8.8	8.17	8.16	8.03
Nitrate (As N) (ug/L)	173	119	112	140	150	90	70	120	50	60	80	80
Chloride (ug/L)	1,135	2,260	1,580	2,810	2,950	1,150	1,200	3,200	4,100	2,430	2,570	2,080
Sulfate (ug/L)	11,610	14,800	10,700	30,130	22,120	9,100	8,500	21,900	9,300	23,500	26,300	26,400
Arsenic (ug/L)	0.7	NQ	0.424	0.56	NQ	0.56	NQ	0.65	0.38	0.69	2.2	NQ
Cadmium (ug/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	0.22	0.21	NQ
Chromium (ug/L)	NQ	0.525	NQ	0.81	NQ	NQ	0.5	0.66	0.41	NQ	4.36	0.80
Iron (ug/L)	NQ	131	46.1	139	90.9	55.3	43.3	77.4	17.6	102	111	64.4
Lead (ug/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	3.23	NQ
Manganese (ug/L)	NQ	6.6	NQ	4.1	1.2	8	4	3.0	2.0	4.0	1.7	1.0
Gross Beta (pCi/L)	NQ	1.8	2.6	1.5	NQ	NQ	NQ	2.0	NQ	1.2	NQ	NQ
Flow Rate, Monthly (gpm)	1647	701	559	48	43	2,470	1,210	530	1,619	45	39	41
Total Dissolved Solids (ug/L)	84,000	102,000	87,000	79,000	85,000	92,000	64,000	72,000	92,000	118,000	97,000	98,000
Mercury (ug/L)	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	0.22
Gross Alpha (pCi/L)	NQ	NQ	NQ	1.6	NQ	NQ	NQ	NQ	1.9	NQ	NQ	NQ
Oil & Grease (ug/L)	NQ			NQ			NQ			NQ		
Carbon Tetrachloride (ug/L)	NQ			NQ			NQ			NQ		
Chloroform (ug/L)	NQ			2			NQ			1.0		
Methylene Chloride (ug/L)	NQ			NQ			NQ			NQ		
Bis(2-Ethylhexyl) Phthalate (ug/L)	NQ			NQ			NQ			NQ		
Total Trihalomethanes (ug/L)	NQ			2			NQ			NQ		
Tritium (pCi/L)	NQ			NQ			NQ			NQ		

µhoms/cm = micro mhos per centimeter; ug/L = microgram per liter; pCi/L = picocuries per liter; gpm = gallons per minute.

Table 3-7. 400 Area Secondary Cooling Water Discharge Monitoring Report Effluents (ST 4501) in 2003.

Sample Parameter	Month						
	February	April	June	August	October[a]	November[a]	December[a]
Flow Rate (gpm)	11.3	13.3	15.7	18.4	11.53	7.9	5.6
PH (maximum)	8.9	9.0	8.8	8.7	8.74	8.77	9.0
Nitrate (ug/L)	182	356	253	266	-	-	-
Nitrite (ug/L)	9.0	9.0	9.0	17.1	-	-	-
Arsenic (ug/L)	2.82	2.56	2.71	3.04	-	-	-
Chloride (ug/L)	16,600	17,700	16,650	19,850	-	-	-
Cobalt (ug/L)	3.2	1.8	1.8	1.8	-	-	-
Cyanide (ug/L)	4.0	4.0	4.0	4.0	-	-	-
Manganese (ug/L)	7.24	1.0	1.0	1.0	-	-	-
Phosphorus (ug/L)	1,095	872	1,075	1,185	-	-	-
Organic Halides (ug/L)	60.2	59.1	49.1	34.3	-	-	-
Total Dissolved Solids (mg/L)	434,500	416,000	423,000	436,000	-	-	-
Lead (ug/L)	1.5	1.5	1.5	1.2	-	-	-
Cadmium (ug/L)	0.153	0.178	0.125	0.192	-	-	-
Gross Beta (pCi/L)	10.3	14.0	7.7	10.5	-	-	-
Tritium (pCi/L)	3,350	3,500	3,000	2,600	-	-	-
Conductivity (µmhos/cm)					558	517	494

gpm = gallons per minute; ug/L = micrograms per liter; mg/L = milligrams per liter.

[a] Discharge permit ST4501 (re-issued in September 2003) requires monitoring only the three parameters listed.

Table 3-8. 100-N Sewage Treatment Lagoon Discharge Monitoring Report Effluents (ST 4507) in 2003.

Sample Parameter	Month											
	Jan	Feb	March	April	May	June	July	August	Sep.	Oct.	Nov.	Dec.
Influent (gal/day)	8,886	8,909	8,636	11,294	10,221	13,243	14,393	12,533	12,678	9,695	10,285	9,981
Effluent (gal/day)	7,824	2,955	951	7,459	928	ND	ND	ND	ND	ND	ND	14,074
Total Suspended Solids (mg/L)	11	13	9	2.5	22	ND	ND	ND	ND	ND	ND	8.75
Total Dissolved Solids (mg/L)	396	390.8	373	363.5	384	ND	ND	ND	ND	ND	ND	432
BOD (mg/L)	9.6	4.5	6.6	3.6	15.1	ND	ND	ND	ND	ND	ND	1.05
pH (average)	8.06	8.07	7.84	7.72	8.08	ND	ND	ND	ND	ND	ND	7.67
Nitrate (mg/L)	3.3	5.7	3.9	1.4	0.6	ND	ND	ND	ND	ND	ND	2.35
Ammonia (mg/L)	9.6	10.3	12.3	17.3	14.6	ND	ND	ND	ND	ND	ND	3.05
Coliform (Colony per 100 ml)	2,439	48	170	18	1300	ND	ND	ND	ND	ND	ND	5,030

ND = No Discharge; gal/day = gallons per day; mg/L = milligrams per liter; BOD = Biological Oxygen Dependence.

Table 3-9. WTP Concrete Batch Plant (WAG 50-5180) and Pit 30 (WAG 50-5181) Discharge Monitoring Report Effluents in 2003.

Sample Parameter	Month											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
WAG 5180												
Process or Mine Dewatering Water												
pH minimum												
pH maximum												
Total Dissolved Solids												
No discharge	X	X	X	X	X	X	X	X	X	X	X	X
Stormwater[1]												
pH minimum			7.65			7.18			8.42			8.13
pH maximum			8.50			8.42			8.50			8.47
No discharge												
WAG 5181												
Process Pond #1	Inactive											
pH minimum									8.23	7.45	7.41	8.28
pH maximum									8.23	8.21	7.41	8.28
No discharge						X	X	X				
Process Pond #2	Inactive											
pH minimum												
pH maximum												
No discharge						X	X	X	X	X	X	X
Stormwater[1]												
Area #1 Stockpile Pond	Inactive											
pH minimum												7.94
pH maximum												8.43
No discharge						X			X			
Area #2 Crusher Pond	Inactive											
pH minimum												
pH maximum												
No discharge						X			X			X

[1] Quarterly Sample

Table 3-10. Sanitary Sewage Discharged to the Soil in 2003.

Area	Population[a]	Discharge,[b] gal/yr (L/yr)
100-DR	23	52,000 (197,000)[c]
100-K	741	2,800,000 (10,500,000)[d]
100-N	199	35,500 (135,000)[e]
200 East	2,207	8,300,000 (31,300,000)[d]
200 West	1,671	6,300,000 (23,700,000)[d]
300	1,591	0[f]
400	377	0[g]
600	348	1,300,000 (4,900,000)
WTP Construction	1,200	4,500,000 (17,000,000)

gal/yr = gallons per year; L/yr = liters per year.

[a] Calendar year 2003 estimates.

[b] Discharges were estimated by multiplying an average number of people assigned to each area (worker populations fluctuate throughout the year), 15 gal/day (57 L/day) sanitary sewage per person per day for 250 working days per year.

[c] Measured discharge value.

[d] A portion of this discharge was transported via pipe or tanker truck to the 100-N Sewage Treatment Lagoon, where it was treated and released to the soil; data on 100-N Sewage Treatment Lagoon effluents are in Table 3-8. The remaining sanitary sewage is assumed to have been discharged to treatment systems, such as septic tanks and drain fields in each respective area.

[e] Measured discharge value (including 100-K and 200 area contributions).

[f] Discharges from the 300 Area (except discharges from 300-FF-1 Remedial Action Project to a septic tank) were routed the city of Richland POTW.

[g] Discharges from the 400 Area were routed to the Columbia Generating Station sanitary sewer system.

4.0 HAZARDOUS SUBSTANCE RELEASES

Hazardous substances, whether radioactive or nonradioactive, released to the environment must be evaluated to determine if they are reportable to federal, state, or local regulatory agencies. Agency notification is required when a released amount exceeds reporting thresholds. Reportable releases of hazardous substances are classified as one of the following two types:

- Nonroutine releases
- Continuous, routine releases.

Each type of release is discussed in the following sections.

4.1 NONROUTINE RELEASES

In accordance with both CERCLA and Washington Administrative Code reporting requirements, no known reportable releases occurred in 2003 from FH, CH2M HILL, BNI, or BHI facilities.

4.2 ROUTINE CONTINUOUS RELEASES

Releases of hazardous substances that exceed CERCLA reportable quantities (RQ) need not be reported immediately to the National Response Center when both of the following conditions are met:

- An initial notification has been completed
- The routine releases are continuous and stable in quantity and rate.

Historically at the Hanford Site, only the continuous, routine releases of ammonia, ammonium hydroxide, and carbon tetrachloride have posed operational difficulties in staying beneath RQs. During 2003, releases of ammonia, ammonium hydroxide, and carbon tetrachloride were below reportable quantities.

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